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BY HAND DELIVERY

Donna R. Searcy,
Secretary
Federal Communications Commission
1919 M Street, N.W. Room 222
Washington, DC 20554

RE: ET Docket No. 92-28

Dear Ms. Searcy:

Transmitted herewith on behalf of Loral Qualcomm Satellite Services, Inc., for filing in the above-referenced docket are an original and four copies of its "Consolidated Reply Comments."

Should there be any questions regarding this document, please communicate with this office.

Respectfully submitted,

William Wallace/ef.

William D. Wallace
(Member of Florida Bar only)

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Before The
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In the matter of)
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Amendment of Section 2.106 of)
the Commission's Rules to)
Allocate the 1610-1626.5 MHz)
and the 2483.5-2500 MHz Bands)
for Use by the Mobile-)
Satellite Service, Including)
Non-geostationary Satellites)
_____)

ET Docket No. 92-28

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

RM-7771	PP-29	PP-32
RM-7773	PP-30	PP-33
RM-7805	PP-31	
RM-7806		

To: The Commission

CONSOLIDATED REPLY COMMENTS OF
LORAL QUALCOMM SATELLITE SERVICES, INC.

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Dated: January 6, 1993

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Satellite Service, Including)	RM-7806
Non-geostationary Satellites)	
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To: The Commission

CONSOLIDATED REPLY COMMENTS OF
LORAL QUALCOMM SATELLITE SERVICES, INC.

Pursuant to the Notice of Proposed Rule Making and Tentative Decision, 7 FCC Rcd 6414 (1992) ("Notice"), Loral Qualcomm Satellite Services, Inc. ("LQSS"), hereby submits its "Consolidated Reply Comments." As discussed below, the comments filed on December 4, 1992,^{1/} generally agree that the Commission should allocate the 1610-1626.5 MHz and 2483.5-2500 MHz bands for the Mobile-Satellite Service and adopt other proposed allocations and policies for spectrum use which are consistent with the long-standing Commission policy of multiple entry in these bands. Accordingly, LQSS urges the Commission to adopt the new MSS allocation and the related proposals and policies outlined in its Comments and these Reply Comments.

^{1/} Comments were filed by LQSS, AMSC Subsidiary Corporation, Constellation Communications, Inc., Ellipsat Corporation, Motorola Satellite Communications, Inc., TRW, Inc., the American Petroleum Institute ("API"), Celsat, Inc., Communications Satellite Corporation ("COMSAT"), and the National Research Council--Committee on Radio Frequencies ("CORF").

I. SUMMARY.

The comments in this proceeding support LQSS's recommendation that the Commission adopt in the United States Table of Allocations the proposed allocation for RDSS/MSS in the 1610-1626.5 MHz and 2483.5-2500 MHz bands as allocated internationally at WARC-92. The comments also indicate that the Commission should adopt a policy to authorize nongeostationary, low-earth orbit satellite systems to provide RDSS/MSS in these bands.

Based upon the recommendations in the comments, the Commission should adopt an allocation plan which implements a policy of multiple entry in the entire L-band and S-band to achieve the full benefits of competition. There is a demand for competitive service to hand-held and other mobile units which such a policy would fulfill, and thereby advance the public interest. In this regard, the Commission should mandate the use of spread spectrum CDMA as a means for multiple entry in the entire bands. CDMA would permit efficient reuse of the spectrum and ensure that the benefits of competition reach consumers.

Moreover, the Commission should flatly reject the demands by Motorola and AMSC that it adopt policies which would grant monopoly use of frequency in these bands to these companies. The comments filed by these parties fail to justify such monopolies based on the merits of their own proposals. Moreover, these two parties' criticisms of other applicants' systems and spread spectrum CDMA as an access technique in the bands are misleading and inaccurate, and cannot be relied upon.

The Commission should not adopt a specific allocation for earth-to-space operation even on a secondary basis in the 1613.8-1626.5 MHz band. Downlink operations in this band would cause harmful interference into primary uplink operations of other MSS systems, and, indeed, self-interference into the satellites of Motorola, the only proponent of bidirectional operation in the L-band, would be sufficiently severe to be self-jamming. Accordingly, no allocation which would allow bidirectional operation in the L-band should be adopted.

As LQSS discussed in its Comments, to implement its recommendations, International Footnote 731X should be adopted, while Footnote 731Y should not be adopted. Other parties agree with LQSS's recommendation that the Commission re-examine its interpretation of RR 2613; also, there is support for use of the 5150-5216 MHz band for feeder links. Contrary to certain comments, operation of LEO systems in the RDSS/MSS allocation would not cause interference into GLONASS and radioastronomy, nor result in an RF radiation hazard.

Finally, the Commission should reject Motorola's argument that its request for a pioneer's preference should have been granted. As the Commission found, Motorola's system does not present innovations which would support grant of a pioneer's preference, and Motorola has failed to demonstrate that this proposal is technically feasible.

II. THE COMMISSION SHOULD ALLOCATE THE 1610-1626.5 MHZ AND 2483.5-2500 MHZ BANDS FOR THE MOBILE-SATELLITE SERVICE.

The comments indicate that there is overwhelming support for allocation in the United States of the 1610-1626.5 MHz and 2483.5-2500 MHz bands for the Mobile-Satellite Service (MSS) as adopted internationally at the 1992 World Administrative Radio Conference ("WARC-92"). As the Commission recognized in the Notice, such an allocation would serve the public interest by opening up currently fallow spectrum for non-geostationary, low-earth orbit (LEO) satellite systems which can provide new and enhanced MSS services on a global basis to hand-held and other mobile devices. See Notice, ¶ 1.

Comments by applicants with respect to use of these bands indicate that there is a potentially large market for such services. See, e.g., TRW Comments, at 9; Motorola Comments, at 6-8; see also LOSS Application, at Pt. I, § 3 (filed June 3, 1991). Potential users of MSS services also noted the benefits to be achieved by the proposed allocation. See API Comments, at 4-5.

Accordingly, LOSS recommends that the Commission adopt the allocation for MSS of the 1610-1626.5 MHz and 2483.5-2500 MHz bands in the U.S. Table of Frequency Allocations (47 C.F.R. § 2.106).

III. THE COMMISSION SHOULD IMPLEMENT ITS POLICY OF MULTIPLE ENTRY THROUGH BAND-SHARING TO ACHIEVE THE BENEFITS OF THE NEW ALLOCATION FOR LEO MOBILE-SATELLITE SERVICES.

With two notable exceptions (Motorola and AMSC), the parties filing comments agree with LOSS that the Commission should adopt

an allocation plan which implements its policy of multiple entry for the new MSS bands to achieve the full benefits of competition. See, e.g., LQSS Comments, at 3-6; TRW Comments, at 18-20. The allocation of these bands to MSS internationally was premised on the announced U.S. policy of multiple entry noted at WARC-92; most parties support implementation of the multiple entry policy through band-sharing with respect to the domestic allocation. See also Constellation Comments, at 3-4; Ellipsat Comments, at 4, 10-11; LQSS Consolidated Reply Comments, at 4-7 (filed March 27, 1992).

As LQSS and other applicants have repeatedly emphasized, competition among service providers allows the marketplace to drive improvements in technology and service, and the public to receive the most up-to-date and efficient service. Competition also fosters a concurrent process of research and development, and ensures that there is no diminution in service if one system is not successful. See LQSS Petition for Rulemaking, at 14-16 (filed November 4, 1991).

That the public interest would be served by promoting multiple entry in this allocation was confirmed by the American Petroleum Institute's potential "key consumers of these new services":

API urges the Commission to provide a mechanism to facilitate competition in the provision of MSS and LEO services. Within the limitations of available spectrum, the Commission will serve the public interest by maximizing the number of organizations permitted to furnish MSS and/or LEO services. Competitive offerings of mobile satellite services will enhance optimal service and pricing for users of these services.

API Comments, at 5. The Commission has been committed to multiple entry with regard to these bands since they were first allocated to the Radio-determination Satellite Service to ensure that the these goals are met. See RDSS Licensing Order, 104 FCC 2d 650, 653-54 (1986). This commitment should continue in the new allocation for RDSS/MSS.

Contrary to the policies and goals of the Commission, the needs and desires of consumers, and the recommendations of the majority of applicants for use of these bands, two parties persist in their unjustified demands that the Commission adopt policies which would ensure MSS monopolies for these bands. In its comments, Motorola reiterates its demand for exclusive use of the 1616-1626.5 MHz segment of the L-band allocated for the MSS uplink. Motorola Comments, at 11-15. Although its arguments have been shown to be inaccurate and contrary to the public interest in numerous prior filings made by various parties, Motorola again attempts to rationalize its request for a monopoly on the grounds that (1) its proposed LEO system is allegedly superior to that of other applicants and (2) "theoretical competition" does not justify application of multiple entry policies in these bands. Motorola Comments, at 11-18.

LQSS has demonstrated the inherent unreliability and inefficiency of the Motorola system in a series of pleadings filed with the Commission and papers presented in other fora, which are referenced in Sections II and III of the Technical Appendix. See, e.g., LQSS Consolidated Opposition to Petitions to Deny, at 30-34 (filed January 31, 1992); LQSS Reply Comments, at 16-19 (filed

March 27, 1992); LQSS Opposition to Motorola Request for Pioneer's Preference (filed April 8, 1992); see also infra text at Section VII; Appendix B. Recent research regarding harmful interference into uplink L-band transmissions through the sidelobes and backlobes of Motorola's transmitting antenna provides one more reason why Motorola's proposed system should be rejected as infeasible, and why its claim of "superiority" is baseless to say the least.^{2/} See Technical Appendix, at § III. Operation of Motorola's proposed system would effectively preclude operation of another domestic MSS system in these bands and may also preclude foreign MSS systems, eliminating competition and raising serious international issues for the United States.

Moreover, the bidirectional, time domain duplex (TDD) design of Motorola's system is unproven. Motorola has not yet demonstrated that its system is even technically feasible.

As to "theoretical competition," there are four (possibly five) applicants, which have indicated that they are committed to developing principles of coordination in order to ensure multiple entry through band-sharing in the 33 MHz allocated for RDSS/MSS. See LQSS Comments, at 9-12; TRW Comments, at 10-13; Constellation Comments, at 4 n.7; Ellipsat Comments, at 10-11; cf. AMSC Comments, at 19-21. Sharing spectrum to implement open entry was the approach previously adopted for the RDSS bands, and is justified here. See RDSS Licensing Order, 104 FCC 2d at 654 ("We

^{2/} These and other issues regarding Motorola's system will likely be topics of the recently convened "Big LEO" Negotiated Rulemaking Committee. Public Notice, Report No. DS-1265 (December 15, 1992).

will select the system design that best assures that the benefits of a competitive marketplace are made available to RDSS users"). Motorola's attempt to garner a monopoly is not justified by any technical aspect of its proposed system and is contrary to the Commission's policies.^{3/} Accordingly, Motorola's request for exclusive use of any part of the RDSS/MSS spectrum must be rejected.

Similarly, AMSC -- which already claims a monopoly license to use the bands at 1545-1559 MHz and 1646.5-1660.5 MHz for MSS operations in the United States -- has once again asked the Commission to reallocate the 1616.5-1626.5 MHz band for "integration" into its monopoly system. AMSC Comments, at 3, 7. In support of its monopoly request, AMSC advances the counterintuitive argument that the Commission can best serve its goals of competition by allocating 10 MHz of the L-band for AMSC's exclusive use. Id., at 10. AMSC's logic is wrong and its proposal should be rejected.^{4/}

AMSC has never demonstrated any need for additional spectrum for its monopoly geostationary system, although it recites "need"

^{3/} Motorola's suggestion (Motorola Comments, at 17) that AMSC's MSS system would provide competition for an exclusive Motorola system in the RDSS/MSS band is wrong. AMSC does not propose to provide RDSS service nor would it provide service to hand-held units to compete with Motorola. An exclusive license for Motorola in the new allocation would effect a monopoly.

^{4/} AMSC also claims that multiple entry would not be possible in these bands, and argues apparently that an allocation to AMSC alone is justified. However, as discussed in various pleadings, AMSC's arguments that multiple entry would not work are inaccurate. See, e.g., Technical Appendix, at § II; see also LOSS Consolidated Reply Comments, at 27-28, Tech. App., at § 3.1 & 3.3 (filed March 27, 1992).

as its sole justification for the proposed allocation of spectrum to it. See LOSS Petition to Deny AMSC Applications, at 25-29 (filed December 18, 1991). Any such "need" could just as easily be fulfilled through use of the band at 1675-1710 MHz which has already been allocated for MSS use in Region 2 as of October 1993 at WARC-92. And, because AMSC's system employs out-of-date technology, granting its request to use the RDSS/MSS band would ensure that the public would not enjoy the benefits of recent LEO satellite technology for decades. For example, while all the LEO applicants propose service to hand-held units, AMSC admits that its proposed MSS system cannot provide such service until its second generation which would be launched in about 2010. See LOSS Petition to Deny AMSC Applications, Tech. App., at § 3.1 (filed December 18, 1991).

In short, allowing AMSC exclusive use of the upper L-band would retard development of new satellite technology, force domestic LEO satellite companies to market new technology abroad, deprive consumers of the benefits of new and enhanced LEO satellite technology for delivery of hand-held communications services, and ensure that there is no competition, and no benefits therefrom. AMSC's proposal for monopoly use of the L-band accordingly should be rejected.^{5/}

^{5/} AMSC's suggestion that the LEO applicants be authorized in the bands allocated at 1850-2200 MHz is not feasible. There is a current market for services which would be provided by multiple LEO satellite systems. These "alternative" bands do not provide adequate spectrum for LEO systems, and in any event, would not become available for MSS for years hence. See LOSS Consolidated Reply Comments, at 20 n.5 (filed March 27, 1992).

IV. MULTIPLE ENTRY SHOULD BE IMPLEMENTED THROUGH MANDATED BAND-SHARING; THE COMMISSION SHOULD INSIST THAT LICENSEES IN THE NEW ALLOCATION EMPLOY SPREAD SPECTRUM CDMA TO ADVANCE MULTIPLE ENTRY.

In response to the Commission's inquiry regarding the use of spread spectrum CDMA or TDMA/FDMA modulation forms as a means to achieve multiple entry (Notice, ¶ 19), six parties filed comments indicating that requiring the use of spread spectrum CDMA would allow the Commission to license multiple systems in the new allocation. See LQSS Comments, at 9-12; TRW Comments, at 10-13; Ellipsat Comments, at 10-11; Constellation Comments, at 4 n.7; AMSC Comments, at 19-21; Celsat Comments, at 7-8. Only Motorola urges the Commission to license systems which use exclusively TDMA/FDMA modulation, which it claims would preclude multiple entry.^{6/} Motorola Comments, at 11-12. Motorola further suggests that band segmentation is an appropriate solution to multiple entry. Id., at 16-18. As LQSS has pointed out in several prior pleadings, there are very sound reasons why the Commission should reject both of Motorola's suggestions, and instead require licensees in the new MSS allocation to employ spread spectrum CDMA and to share the entire L-band and S-band to achieve multiple entry.

By requiring licensees to employ spread spectrum CDMA, the Commission would achieve these among other benefits for consumers:

- (a) efficient frequency reuse;

^{6/} The other parties filing comments -- API, COMSAT, and CORF -- took no position on this issue.

- (b) availability of more capacity from several systems than otherwise would be available from one system;
- (c) the potential for a greater number of circuits available to/from a single area;
- (d) multiple entry, with each licensee having access to the full band, ensuring competition;
- (e) marketplace incentives for research and development;
- (f) marketplace allocation of frequency use among systems; and,
- (g) the ability to coordinate with international systems.

None of these benefits would be available if Motorola's TDMA system were licensed, and none of these benefits would be technically feasible if CDMA and TDMA systems were licensed in separate band segments. See Appendix C.

The choice is clear: The Commission should require the use of spread spectrum CDMA by systems authorized to use the RDSS/MSS allocation, as the Commission previously required for the RDSS allocation.

A. Spread Spectrum CDMA Provides an Efficient Method to Achieve Multiple Entry.

LQSS has demonstrated previously that the use of spread spectrum CDMA allows several systems to operate using the same spectrum and to produce greater capacity among them than would a single system. See LQSS Consolidated Opposition to Petitions to Deny, at 30-33 (filed Jan. 31, 1992); LQSS Consolidated Reply Comments, at 8-9 (filed Mar. 27, 1992). In summary, use of spread spectrum CDMA is most efficient because:

- (1) Spread spectrum CDMA allows a single system to produce greater capacity than a single FDMA/TDMA system because CDMA permits more efficient frequency reuse;
- (2) Spread spectrum CDMA allows multiple systems to achieve a capacity gain over that of a single system, but no such capacity increase can be achieved by FDMA/TDMA systems because, as Motorola has indicated, multiple FDMA/TDMA systems cannot use the same spectrum.

See Technical Appendix, at § II.A; Appendix C. These benefits of spread spectrum CDMA are sufficient to justify rejection of Motorola's monopoly proposals.

For example, the capacity of MSS systems would be critical to public needs during emergencies and natural disasters when terrestrial communications would likely be disrupted. In such situations, a large number of simultaneous circuits would be needed for a small area, e.g., Southern Florida after Hurricane Andrew, or the Hawaiian island of Kauai after the recent typhoon. In such circumstances, the capacity limitations of Motorola's system would be detrimental to the public welfare.

Motorola's amended system proposal limits the service provided to the area within a 300-400-mile diameter beam to a claimed 730 duplex circuits, due to inefficient allocation of the bandwidth required by a TDMA system. Motorola's monopoly TDMA system would preclude service of more than the claimed 730 circuits, limiting simultaneous calls from the disaster area to a maximum of 730.

On the other hand, CDMA systems, like Globalstar and those proposed by other LEO applicants, could serve thousands of circuits from the same area utilizing the same bandwidth. Due to overlapping beams of the CDMA systems, power sharing is automatic, allowing maximum utilization of the band during emergencies.^{7/}

Use of CDMA for RDSS/MSS systems would thus allow emergency and disaster relief agencies greater flexibility in communication needs, making available peak loadings from these areas far in excess of non-emergency loading situations. The rigidly structured TDMA system of Motorola, however, is limited by self-interference and a hard limit on the maximum number of circuits available, and would not have the flexibility to address public needs during such emergencies. Even this single example demonstrates that use of spread spectrum CDMA is superior to TDMA, that the public interest is better served by the CDMA approach, and that Motorola's proposed system should be rejected.

B. Band Segmentation Results in Inefficient Use of Spectrum.

LQSS has also previously shown that band segmentation, as proposed by Motorola to justify its system, that is to cobble together a method to accommodate multiple non-homogenous systems, would result in inefficient use of the new allocation and degraded service to consumers. See Motorola Comments, at 16-18. Band

^{7/} Such capacity would be even greater than the capacity identified in these system's applications because all the proposed CDMA systems are seeking non-emergency toll quality signals. Accordingly, the current link budgets are conservative with respect to the availability of channels for an increase in calls during such an emergency.

segmentation achieves none of the efficiencies and capacity gains of band-sharing through CDMA listed at the beginning of this Section. See LOSS Consolidated Reply Comments, at 10-14 (filed March 27, 1992).

Indeed, band segmentation would result in spectrum warehousing in the TDMA segment because it would eliminate the capacity gain from frequency reuse by CDMA (reducing overall capacity) and it would preclude a marketplace-driven allocation of band usage (permitting the underused segment to lie fallow). And, if the TDMA licensee fails to construct, launch or provide competitive service, then surviving CDMA licensees would not be able to expand operations into the TDMA segment.

Moreover, a fragment of the band cannot be used as efficiently -- if there is even sufficient spectrum for technical and financial feasibility. As each CDMA system attempts to maximize capacity lost because of band segmentation, there would be an increase in interference, which would reduce capacity.

Given the proven benefits and spectral efficiency of spread spectrum CDMA, and the overwhelming support for this modulation form among interested parties, there is no reason for the Commission to consider alternatives which include TDMA and/or band segmentation.

C. Motorola's and AMSC's Attacks on CDMA Are Unfounded.

Motorola and AMSC -- both of which have proposed that the Commission grant to them respective exclusive allocations of 10 MHz in the L-band -- attack the proposed use of spread spectrum

CDMA by other applicants to achieve multiple entry. Motorola Comments, at 13-16; AMSC Comments, at 15-16. Motorola and AMSC have obvious motives for attacking CDMA other than helping the Commission decide how the public interest would be best served. But, as LQSS has pointed out before, the success of CDMA is a matter of physics, not "magic," and proper analysis demonstrates that CDMA would allow multiple systems to operate in these bands. See LQSS Consolidated Reply Comments, at 8-9 (filed Mar. 27, 1992); see also Technical Appendix, at § II.

1. Motorola.

Motorola's recommendation that the Commission license TDMA/FDMA systems is based upon (1) its desire to be granted a monopoly in the spectrum it seeks, and (2) its flawed and inaccurate analyses of spread spectrum CDMA. As LQSS has demonstrated before, grant of a license to a TDMA/FDMA system operating in these bands would be tantamount to grant of a monopoly to the licensee. See LQSS Consolidated Opposition to Petitions to Deny, at 33-34 (filed January 31, 1992). Indeed, Motorola itself claims that its system cannot share the spectrum with the other proposed LEO systems. See, e.g., Motorola Consolidated Petitions to Dismiss and/or Deny and Comments, at 48 (filed December 18, 1991) ("different LEO systems operating in the RDSS uplink band will not be able to share the same frequency spectrum"); Motorola Reply Comments, at 10 (filed January 31, 1992). The Commission should reject the use of FDMA/TDMA in the new allocation and avoid granting a monopoly to one service provider.

In any event, Motorola is wrong in its claim that the feasibility of spread spectrum CDMA has not been demonstrated. CDMA technology is designed to allow multiple systems to share in the interference intensive environment of MSS communications. See Technical Appendix, at § II.B. LQSS and other applicants have provided numerous technical discussions showing that CDMA has been proven to work, and Motorola has yet to provide an analysis which refutes the demonstrated advantages of this technology.

2. AMSC.

Not only is AMSC's attack on spread spectrum CDMA inaccurate, it is completely at odds with AMSC's suggestion that it would agree to use CDMA to coordinate with multiple entrants in the new MSS spectrum. Compare AMSC Comments, at 15 (use of CDMA by multiple entrants would result in "very little capacity" because of interference constraints) with AMSC Comments, at 19-20 (AMSC states willingness to use CDMA to explore sharing of available spectrum by all proposed MSS systems).

LQSS has previously refuted AMSC's criticisms of CDMA. See LQSS Consolidated Opposition to Petitions to Deny, at 31 n.18 (filed January 31, 1992). AMSC's comments here regarding capacity are equally misleading. See Technical Appendix, at § II.C. Based on AMSC's own calculations, LQSS demonstrates in the Technical Appendix that multiple satellite systems can operate simultaneously with no loss in Globalstar's capacity. Id. AMSC's analysis is not correct, and cannot be relied upon. AMSC's calculations of harmful interference are predicated on 11 systems operating in the same spectrum. Moreover, when AMSC's assumptions

are used to calculate interference in the downlink for a more reasonable number, e.g. four systems, then system capacity for Globalstar is similar to that predicted in LQSS's application. AMSC's calculations for uplink power are similarly misleading -- using AMSC's assumptions, LQSS for a single satellite would have an interference limit of 10,000 users. Given the errors in AMSC's calculations, it is apparent that AMSC still has not provided an accurate technical discussion which supports its criticisms of CDMA.

V. THE COMMISSION SHOULD RESERVE THE NEW ALLOCATION FOR USE BY LOW EARTH ORBIT SATELLITE COMMUNICATIONS SYSTEMS.

The Commission recognized in the Notice that non-geostationary, low-earth orbit (LEO) satellite communications systems offer the potential to bring to consumers "a wide range of new and low-cost services, with a potentially worldwide scope, such as voice, facsimile and data messaging, and fleet surveillance and control." Notice, at ¶ 1. These views were reflected in the comments of both the applicants and the potential consumers which urged the Commission to make these bands available for use by LEO systems. See, e.g., LQSS Comments, at 14-15; TRW Comments, at 16-18; API Comments, at 4-5; see also Technical Appendix, at § V.

The comments make clear that there are compelling reasons for reserving this spectrum for LEOs. First, AMSC, the only GSO applicant, already claims exclusive use of 28 MHz of spectrum. See, e.g., Motorola Comments, at 9. AMSC has itself requested additional spectrum in other frequencies, and WARC-92 made

additional spectrum available for MSS. See LQSS Petition to Deny, at 24 (filed December 18, 1991); LQSS Consolidated Reply Comments, at 7 (filed March 27, 1992). The Commission should not deny or restrict the availability of LEO services to the public by further consideration of a GSO system which has no need for this spectrum.

Moreover, there are benefits of the proposed LEO systems which AMSC's proposal cannot match. See LQSS Petition to Deny AMSC Applications (filed December 18, 1991); LQSS Consolidated Reply Comments (filed March 27, 1992). For example, as LQSS and number of applicants have pointed out, LEO satellite systems are not only spectrum efficient, they are also cost effective. LEO systems would provide more capacity for less cost than GSO systems because LEO systems require only about the same expense to launch, and because LEO systems -- unlike GSO systems -- are inherently global in nature, allowing expenses to be spread over more subscribers, reducing costs to domestic users. Indeed, based on equivalent service to hand-held units, LQSS has calculated that the cost per subscriber of a LEO system will likely be about \$37.00, whereas for GSO systems the cost would run up to \$222.00 per subscriber. See Technical Appendix, at § V.A.

Also, as the LEO applicants point out, and as AMSC admits, GSO technology would not allow service to hand-held units for another two decades. LEO systems would provide such service from the time the satellites are operational -- about five years after grant of construction permits. Therefore, if the Commission licenses LEO systems in the new allocation, United States consumers may have available global voice, radiopositioning and

data messaging services from any location via a hand-held unit before the year 2000, but the GSO system proposed by AMSC would not provide service to hand held units for another decade beyond that.^{8/} See AMSC Comments, Tech. App., at 12 (December 4, 1992); LQSS Consolidated Reply Comments, at 25 (filed March 23, 1992).

For these reasons, and based on the comments in this docket, the Commission should ensure that LEO systems are licensed in the new allocation.^{9/} In this regard, LQSS notes again that the Commission properly dismissed the petition of Celsat, Inc. to allocate this spectrum for its proposed HPCN. See LQSS Comments, at 16. The comments filed by Celsat in this proceeding indicate that, given it has filed no application and to the extent technical information exists for its HPCN, Celsat has concluded

8/ Celsat attempts to suggest that the market limitations of GSO systems, like Celsat's theoretical HPCN, are a virtue, and that the Commission should not rely upon LEO systems because they would require foreign investment, international frequency coordination, and agreements with foreign PTTs. Celsat Comments, at 3. These "problems" are nothing more than necessary aspects of conducting business on a global scale, which LEO technology has made possible. GSO systems would not, contrary to Celsat's claims, be immune from addressing these issues.

9/ In what appears to be an attempt to garner use of this spectrum despite having failed to show any need for such an allocation, AMSC states in its Comments that if the Commission adopts a policy of licensing multiple CDMA MSS systems in the new allocation, then it "would work with other interested parties toward exploring ways by which all of the proposed MSS systems can share the available spectrum in the new bands." AMSC Comments, at 19. However, just a few pages before this statement, AMSC expressed its view that the use of spread spectrum CDMA as an access method for multiple systems in the new allocation would provide each system so little capacity as to render it useless or virtually so. AMSC Comments, at 15, Tech. App. at 8-9. This inconsistency raises questions which are not explained in AMSC's proposal to use CDMA.

that its system is very flexible and can be accommodated at various frequencies in a variety of configurations. But Celsat is not an applicant nor has it done more than file pleadings. The Commission should not limit the development of LEO systems, for which applications have long been on file and for which the new allocation is most appropriate, based on the chimerical claims of Celsat. It should instead authorize LEO systems for use in the RDSS/MSS bands.

VI. THE COMMISSION SHOULD NOT ADOPT THE WARC SECONDARY ALLOCATION FOR A SPACE-TO-EARTH LINK IN THE L-BAND.

In response to the Commission's inquiry regarding use of the L-band for space-to-earth transmissions on a secondary basis in the 1613.8-1626.5 MHz band (Notice, ¶¶ 28-29), five parties filed objections indicating that bidirectional operation in the L-band is unworkable and thwarts numerous Commission goals recognized in the Notice, including multiple entry, authorization of only cost-efficient systems feasible for construction, efficient use of the entire spectrum, and avoidance of harmful interference into existing international users of the band. See LOSS Comments, at 5-6; TRW Comments, at 13-16; Constellation Comments, at 5-6; Ellipsat Comments, at 4-5, 11; AMSC Comments, at 14-15, Tech App. Section III. One party expressed severe reservations that such an allocation would cause harmful interference into other users of the bands. CORF Comments, at 4.

The comments discuss at length the difficulty posed by proposed space-to-earth operation in the 1613.8-1626.5 MHz bands for operations of other domestic and international users. For

example, even AMSC states that its "analysis indicates that MSS downlinks in the 1613.8-1626.5 MHz band would cause severe harmful interference to Aeronautical Radionavigation, Fixed and Radio Astronomy services as well as to any other MSS systems that operated their uplinks in the band." AMSC Comments, Tech. App., at 6-7. LQSS agrees with AMSC's statement that:

the downlinks have far greater interference potential than the associated uplinks. Thus Motorola's recent proposal to relocate the uplink operations of the other MSS system Applicants to frequencies outside the 1616-1626.5 MHz band is essentially a proposal to displace a primary service by a secondary service.

Id., at 7.

LQSS currently is undertaking extensive analysis of the interference situations involving non-geostationary satellite systems, including potential interference from non-geostationary satellites operating using the 1613.8-1626.5 MHz band in the space-to-Earth direction into other MSS systems using this band in the Earth-to-space direction. As discussed in LQSS's Comments (at 12-14), radiation from the backlobes and sidelobes of a satellite using this band in the space-to-earth direction would cause harmful interference to uplink transmissions of other MSS satellites. Motorola, the only proponent of bidirectional operation, has yet to demonstrate that operation in this manner is feasible. Indeed, LQSS's calculations indicate that such severe self-interference would occur to Motorola's transmissions as a result of downlink operations in the L-band that Motorola's system would be self-jamming. See Technical Appendix, at § III.A.